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REVIEWS

The Natural History of Igneous Rocks. By ALFRED HARKER. New York: Macmillan, 1909.

The scope of Harker's *Natural History of Igneous Rocks* may be indicated by the titles of the chapters which are as follows: (i) "Igneous Action in Relation to Geology;" (ii) "Vulcanicity;" (iii) "Igneous Intrusion;" (iv) Petrographical Provinces;" (v) "Mutual Relations of Associated Igneous Rocks;" (vi) "Igneous Rocks and Their Constituents;" (vii) "Rock-Magmas;" (viii) "Crystallization of Rock-Magmas;" (ix) "Supersaturation and Deferred Crystallization;" (x) "Isomorphism and Mixed Crystals;" (xi) "Structures of Igneous Rocks;" (xii) "Mineralisers and Pneumatolysis;" (xiii) "Magmatic Differentiation;" (xiv) "Hybridism in Igneous Rocks;" (xv) "Classification of Igneous Rocks."

The author emphasizes the correlation between the general geologic history of a given region and the igneous activity in the same region, which he makes on the general basis of the idea that igneous action is a result of crustal movements, and the further idea that these movements produce magmatic differentiation over continental areas; thus leading to magmas of different composition in regions affected by different kinds of crustal movements. It becomes apparent, therefore, that the author accepts the idea of differentiation, and applies it as a means of explaining the distribution of igneous rocks in all parts of the earth's crust, whether those parts be treated in detail or on the largest scale. It follows as a natural consequence that he explains petrographic provinces as due to differentiation over large areas, while the different types of a given province are explained as due to differentiation within that province.

On the other hand, Harker accepts Vogt's conclusion that silicates, silica, and water are miscible in all proportions at the temperatures of magmas, and that consequently there can be no liquation or spontaneous division of a single magma into different parts while the whole is still liquid; except insofar as such a division may be explained by differences in pressure, temperature, or density. He further concludes that the liquation due to pressure and density would be negligible in amount, while he thinks the differential action of gravity would perhaps suffice to concentrate the denser constituents in the lower portion of a large magma. With this possible exception he attributes differentiation to the concurrent

action of crystallization and diffusion, not accepting Becker's conclusion that diffusion would proceed so slowly as to be ineffective except for very short distances.

In chaps. vi-x, Harker discusses the crystallization of rock-magmas from their constituents on the basis of new data developed by Vogt, Tamman, Day, Allen, Wright, Adams, and others. He applies to the solution of the problems involved, the principles of physical chemistry as developed by Roozeboom, Ostwald, and Van't Hoff, and concludes that textures are in part due to these laws, and to the relation of the actual composition of the magma to that of the dominant eutectic.

In discussion of hybridism Harker denies the importance of magmatic assimilation except on the smallest scale and considers hybrid rocks to be a minor factor in the history and development of any igneous complex.

In his last chapter the author makes no attempt to present a new classification of rocks, although he says that the American quantitative classification marks a "retrograde movement, for here the artificial element is applied to the complete exclusion of the natural." He believes that the time is not yet ripe for a natural classification of igneous rocks, although he agrees with Becker that such a classification will probably be based upon the eutectics occurring in rocks, and he suggests further that it will involve the mode of development of various rock-types from a single parent magma through the action of differentiation; thus developing something which is comparable to the principle of descent used in the classification of animals and plants.

It appears therefore, that the book is an excellent summary of our present knowledge, and well suited for use with advanced students of petrology.

A. N. W.

Cambrian Geology and Paleontology. By CHARLES D. WALCOTT.
Cambrian Sections of the Cordilleran Area. From *Smithsonian
Miscellaneous Collections*, Part of Vol. LIII, pp. 167-230.
Ten plates. Washington, December 10, 1908.

This paper is a continuation of Dr. Walcott's study of the Paleozoic rocks of western North America. The object of this preliminary correlation is to show the interrelations of the Cambrian strata and faunas in the Cordilleran area, particularly in California, Utah, Nevada, Montana, and British Columbia. Five generalized sections are described in detail as to character and content. There seems to be a close relationship